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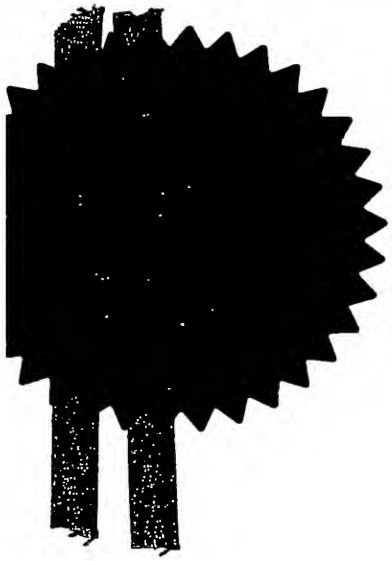

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1.	Your reference	BEC/S3623-00033
2.	Patent application number	
3.	Full name, address and postcode of the or each applicant Patents ADP Number If the applicant is a corporate body, give the country/state of incorporation	Spreckelsen McGeough Ltd Sundial House High Street Horsell Woking Surrey GU21 4SU United Kingdom 0794391001 07443047002 England & Wales
4.	Title of Invention	Opening Devices for Foil Closures
5.	Name of agent Address for service in the United Kingdom to which all correspondence should be sent Patents ADP number *(if you know it)*	**Nabarro Nathanson** Lacon House Theobald's Road London WC1X 8RW 05768304002 ✓
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Description	8
Claims	2 DL
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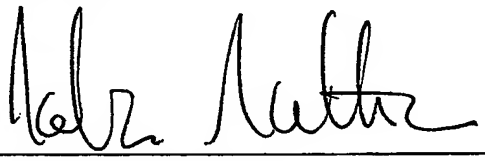
Signature	
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Opening Devices for Foil Closures

Background of the Invention

The present invention relates to opening devices for closures that use a ring pull or tab to tear a foil seal.

The present invention addresses the technical problem of minimising the effort needed to open a container closure. It is important to keep the force required to open containers to a minimum in order to reduce the risk of spillage during opening and to enable frail users to open the closure.

When a ring pull device is used to open a container, the force is transmitted from the finger in the pull ring to a connected part that initiates the opening. In the case of a ring pull for opening a metal can, the tab or pull ring is connected to a pointed nib, which acts on a frangible portion of a seal. The nib concentrates the force applied by the user at a specific point in order to reduce the force that the user needs to apply.

However when a ring pull is used to tear a plastics seal, it is typically connected to a removable part within a spout by means of one or more legs. See for example GB-A-2 377 701 (Spreckelsen McGeough Ltd) US-A- 4 682 702 (Gach 1) or US –A- 4 815 618 (Gach 2). In Gach 1 a spiral weakening groove is provided in the removable part, which takes the form of a sealing disc that provides the sole seal across an opening in the spout. The spiral groove divides the disc into a tear strip. The legs of the pull ring are attached to the tear strip at the periphery of the disc. Pulling up on the ring starts the separation of the tear strip along both sides of the strip opening the closure. Gach 1 is primarily designed for tamper evidence and ease and obviousness of separation is important for this reason. The pressure required to initiate the tear is determined solely by the depth of the groove. The need to tear a foil creates a further technical problem.

Spreckelsen McGeough Ltd and Gach 2 disclose a closure comprising:

a spout defining an opening,

a removable plastics part connected to the spout by means of a frangible region,

a pulling device connected to the removable part by means of a leg, and

a foil secured to the removable part and the spout to form a seal across the opening.

With this type of closure the removable part is typically a circular disc. An upward pulling force applied by the user during opening is transmitted to the foil. The force applied by the pulling device is typically distributed over a large arc of the frangible region extending in both directions away from the mounting of the device and also inwardly towards a centre of the removable part. A tear is initiated when the pressure on the foil reaches a tearing threshold, which depends on the nature of the foil. When this type of closure is used with foils having a polypropylene (as taught by Gach 2) or PET compatible layer – as opposed to a polyethylene compatible layer as taught in Spreckelsen McGeough Ltd – the threshold opening pressure is relatively high. This makes this type of closure difficult to open when used with polypropylene and PET containers. This technical problem of achieving an opening pressure when the pulling force is distributed over a large area increases with the size of the removable part, making it extremely difficult to open wide mouthed PET or polypropylene containers with this type of closure.

Once the tear has been initiated, the foil is then torn in both directions away from a base of the leg around the circumference of the disc. The greater the circumference the more upward force is required in order to resolve sufficient force in both directions in the foil bridging the frangible region in order to create and propagate tears running both ways round the disc.

Solution of the Invention

It has now been appreciated that the opening force could be reduced by reducing the length of an arc of the frangible region over which an initial pulling force is dissipated when the tear is being initiated. The present invention solves the technical problem by

providing a structure that achieves this requirement.

The ease of opening can also be facilitated by propagating the tear along a one-way route.

The closure of the present invention is characterised in that the leg is mounted on the removable part adjacent to a slit in order to limit an arc of the frangible region to which a pulling force created by the pulling device is applied and increase a tearing pressure on the foil.

The present invention also provides a closure comprising a spout defining an opening, a plastics part connected to the spout by means of a frangible region and defining a slit, a foil attached to the plastics part and the spout to form a seal across the opening, and a device for applying a force at or adjacent to the slit.

Placing the mounting of the pull ring close to the slit reduces the length of the arc over which an initial pulling force is dissipated when the tear is being initiated reducing the force required to tear the foil by up to 40%. The presence of the slit ensures that the pulling force applied during opening lifts a corner of the part to one side of the slit to which the leg is attached. It is therefore preferable to mount the leg as close as possible to the corner. In a preferred embodiment two spaced legs are used to connect the removable part to the pulling device and this allows the leg closer to the slit to act independently. Once initiated, the tear will propagate in one direction only around the removable part thus reducing the opening force. By using a slit instead of a weakened groove as in Gach 1, only one side instead of two needs to tear to open the closure.

The mounting position of the legs of the pull ring in Gach 1 is significantly separated from a tip of the spiral tear strip so that, even if this closure were adapted for use with a foil, the arc over which the pulling force is applied is similar to that for a plane disc.

The closure is particularly advantageous when used with a double-sided foil with a polypropylene or PET membrane to weld to a container of that material, as such foil is more difficult to tear.

Preferably the removable part is a plate having a raised land to which the foil is attached rather than being welded to the entire surface as taught in Gach 2. Reducing the surface area of the land reduces the energy needed for induction heat-sealing of the foil to the spout and thereby increases the speed at which the closures can be produced and used.

Preferably the slit extends from an edge of the plate passing close to and beyond the centre. The slit could curve or even define a spiral but a straight slit is simpler to mould and effective.

The same solution can be applied to foil sealed plastics closures where the tear is initiated by a pushing action rather than the prior art pulling device. As discussed above, modern metal ring pull openings effectively push on a frangible region by means of a nib. This reduces the littering problem as the ring pull and the part of the closure that closes the opening (referred to above as a removable part) are not removed but remain connected to the container with the closure part being pushed into the body of the container. In this variation the force-applying device is preferably a pushing device having a nib acting initially on the foil within the slit or on the plastics part adjacent to the slit, instead of a pulling device.

As with the previous embodiment, the nib enables the threshold pressure to initiate the tear in the foil to be created with reduced force.

Brief Description of the Drawings

In order that the invention may be well understood, an embodiment thereof will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows a top plan view of a closure; and

Figure 2 shows a section on the line II-II in Figure 1.

Detailed Description of an Embodiment.

A closure 2 takes the form of a spout 4 intended to be fitted to a container body. The spout defines an opening 6 that is sealed by a foil 8 and a removable plate 10 in the form of a disc. A pulling device 12 in the form of a pull ring is mounted to the disc 10 by means of a pair of spaced legs 14.

Although the closure is shown as having a circular configuration, which is preferable for pouring, it will be appreciated that the closure may without deviating from the principles described be square or oval or have other geometries.

The spout 4 has a tapered annular wall 20 that provides a pourer for the closure 2. The wall 20 is supported on a base 22 that fits to a container body. In this embodiment the base 22 comprises a flat annular flange 24 surrounding the opening 6 and a skirt 26 designed to be fitted to the container body. It will be appreciated that the design of the base 22 can be modified for use with different types of container including all types of plastics bottles as well as containers made of composite materials incorporating a plastics layer such as steel/plastics laminate, aluminium/plastics laminate, paper/plastics laminate and paper/EVOH/plastics laminate.

The wall 20 terminates in a projecting pour lip 28, which is slightly tapered towards a pouring edge.

The spout 4 is intended to be closed by means of an overcap (not shown). The overcap may snap fit over the wall 20 as described in Spreckelsen McGeough Ltd. Alternatively screw threads may be formed on an external surface of the wall 20 or the skirt 26 in order to engage with a threaded overcap.

Opposite the pour lip 28, the wall 20 merges with the annular flange 24 of the base 22. Inside the wall 20 the removable disc 10 is connected to the spout 4 at a frangible region 30 that takes the form of an annular gap, which is bridged by a plurality of spaced bridges 32. The bridges 32 are not evenly spaced relative to one another around the frangible region 30. Approximately twice as many bridges 32 are provided

in a quarter of the frangible region adjacent the legs 14 where the tear is initiated.

The pulling device is a pull ring 12 supported on the disc 10 by means of a pair of spaced legs 14.

The disc 10 is heat sealed to the foil 8 at a raised land 34 on a base of the disc 10. The land 34 has a portion 36 extending around an edge of the disc adjacent to the frangible region 30 with an enlarged portion 38 directly beneath the mounting of the legs 14. A second portion 40 of the land projects from the centre of the disc 10 to the enlarged portion 38 and communicates with the base of legs 14. This portion 40 is provided for the purposes of efficient injection moulding of the closure 2. The foil is also heat sealed to an underside of the annular flange 24. It will be appreciated that it is preferable to keep the area of the land 34 as small as possible to minimise the energy needed for creating the heat seal, while retaining the foil 8 in position and enabling it to be torn when the removable part 10 is lifted by the pulling device 12. When the closure is fitted to a container, an exposed lower face of the foil 8 is heat sealed to the container.

The foil 8 must be held securely directly beneath the pulling device in order to ensure that the pulling force initiates the tear in the frangible region 30 and does not separate from the disc as the closure is opened. The enlarged portion 38 of the land also stiffens the disc 10 at the junction between the pulling device and the disc to prevent breakage at this point.

A slit 50 extends from an edge of the disc just beyond the enlarged portion 38 of the land 34. The slit passes off centre skirting the end of the land portion 40 and terminates short of an opposite edge of the disc 10. The slit is provided with an enlarged circular end 52 in order to reduce the risk of the removable part 10 being severed in two during removal. Such breakage could occur if the disc 10 is broken at a neck between an end 52 of the slit across to the frangible region 30. The land 34 has a further enlarged portion 54 in this neck area opposite the end 52 of the slit 50 to prevent the removable part 10 breaking at this point. Weak bridges 56 cross the slit 50 at its open end adjacent the corner on which the legs are mounted and at an

intermediate point. These are to enable the disc to be moulded and are sufficiently fine to sever when subjected to minimal pulling force.

The slit 50 effectively divides the plate 10 into a U shape with a pull ring attached solely and securely to one limb. Due to the open slit 50, the pulling force applied by pulling on the pull ring 12 is concentrated solely on the limb to which it is attached. The foil 8 will initially stretch in the region attached to the enlarged land portion 38. The presence of the slit 50 reduces the arc of the frangible region over which the force is applied. The pulling device needs to be mounted as close as practicable to the corner at the end of the slit to ensure that the pulling force is applied over as small an area as possible so that a tearing threshold pressure is achieved with minimal exertion in order to initiate the tear. As the legs 14 are mounted on a readily free able corner of the plate 10 next to the slit 50, the effect is to cause the user to pull, not directly upwards, but at an angle skewed towards the intended direction of propagation of the tear. This further reduces the area of the foil that is subjected to the pulling force. Using two legs allows the leg 14 closest to the slit 50 to define the centre of the arc.

Continued pulling propagates a tear around the edge of the disc 10 adjacent the enlarged land portion 38. The user will then pull the disc away directing the tear away from the slit all the way around the circular edge of the disc 10. A secondary tear directed towards the puller will generally be created beneath the slit as the released part of the disc is lifted by the opening action. The circular end 52 of the slit 50 and the enlarged land portion 54 are intended to prevent the disc breaking so that only a semicircular part is removed. However for some containers, removal only of part of the disc may be sufficient.

The slit 50 may have various configurations that will effectively vary the way the disc is removed in a single strip-like way. A J-shape or spiral slit may be used.

Variation

In a variation, the closure has a pushing device in place of the pulling device. The pushing device has a nib or tooth that acts either directly on the foil within the slit 50

or on the same portion of the plastics part 10 adjacent to the slit 50 as the leg mounting of the pull ring 12. The plastics part 10 is not completely removed when this embodiment of the closure is opened, as it will be pushed into the container. This is preferred for those types of drinks container that are opened in public places where removable closure parts could create a littering problem.

Various designs of pushing device may be employed dependent on the strength of the foil that has to be torn. A pull ring or tab mounted on a pivoting point to one side of the frangible region as used with metal closures may be employed. The pushing device could also be a tab mounted directly to the plastics part 10.

As with the previous embodiment, the nib enables the threshold pressure to initiate the tear in the foil to be created with reduced force. Continuing to push the plastics part 10 into the container will propagate the tear. Where the nib acts directly on the foil, shoulders of the pushing device will act on plastics part 10 at the sides of the slit after the nib has initiated the tear causing the tear to be propagated in both directions away from the slit.

Claims

1. A closure (2) comprising:

a spout (4) defining an opening (6),

a removable plastics part (10) connected to the spout by means of a frangible region (30),

a pulling device (12) connected to the removable part by means of a leg (14), and

a foil (8) attached to the removable part and the spout to form a seal across the opening, characterised in that

the leg (14) is mounted on the removable part (10) adjacent to a slit (50) in order to limit an arc of the frangible region (30) to which a pulling force created by the pulling device (12) is applied and increase a tearing pressure on the foil (8).

2. A closure as claimed in claim 1, characterised in that the presence of the slit (50) enables an opening tear to propagate in one direction around the frangible region (30).

3. A closure as claimed in claim 1 or 2, wherein the foil (8) is welded to a container closed by the closure.

4. A closure as claimed in any one of the preceding claims, characterised in that the slit (50) extends from an edge of the plate passing close to and beyond the centre.

5. A closure as claimed in any one of the preceding claims, characterised in that the slit (50) is straight.

6. A closure as claimed in any one of the preceding claims, characterised in that the removable part is a plate having a raised land (34) to which the foil (8) is attached.

7. A closure as claimed in any one of the preceding claims, characterised in that the pulling device (12) is connected to the removable part by two spaced legs (14).

8. A closure comprising a spout defining an opening, a plastics part connected to the spout by means of a frangible region and defining a slit, a foil attached to the plastics part and the spout to form a seal across the opening, and a device for applying a force at or adjacent to the slit.

9. A closure as claimed in claim 8, characterised in that the force-applying device is a pushing device having a nib that acts initially at the slit.

10. A closure as claimed in claim 8, characterised in that the force-applying device is a pushing device having a nib acting on the plastics part adjacent to the slit.

11. A closure substantially as herein described with reference to the accompanying drawings.

Abstract

Opening Devices for Foil Closures

An opening device for a foil closure can be fitted to a container body. The device comprises a spout (4) with a removable disc (10) attached to a pull-ring (12). The disc (10) is secured to the spout (4) by means of a frangible region (30). A foil (8) is sealed to a raised land (34) on a base of the disc (10). The land (34) has a portion (36) extending around the edge of the disc (10), an enlarged portion (38) directly beneath the mounting of the pull-ring (12) and a second portion (40) extending from the enlarged portion (38) to the centre of the disc (10). A slit (50) extends from the edge of the disc adjacent to the enlarged land portion (38) and passes off centre terminating short of the opposite edge of the disc (10). When the pull ring (12) is pulled a tear is initiated in the foil (8) at the enlarged land portion (38) and propagates away from the slit (50) around the frangible region (30). The placing the mounting of the pull ring (12) close to the slit (50) reduces the length of the arc over which an initial pulling force is dissipated when the initial tear is being initiated reducing the force required to tear the foil (8) by up to 40%. The slit (50) also enables the tear to be propagated in one direction around the disc (10).

(Figure 1)

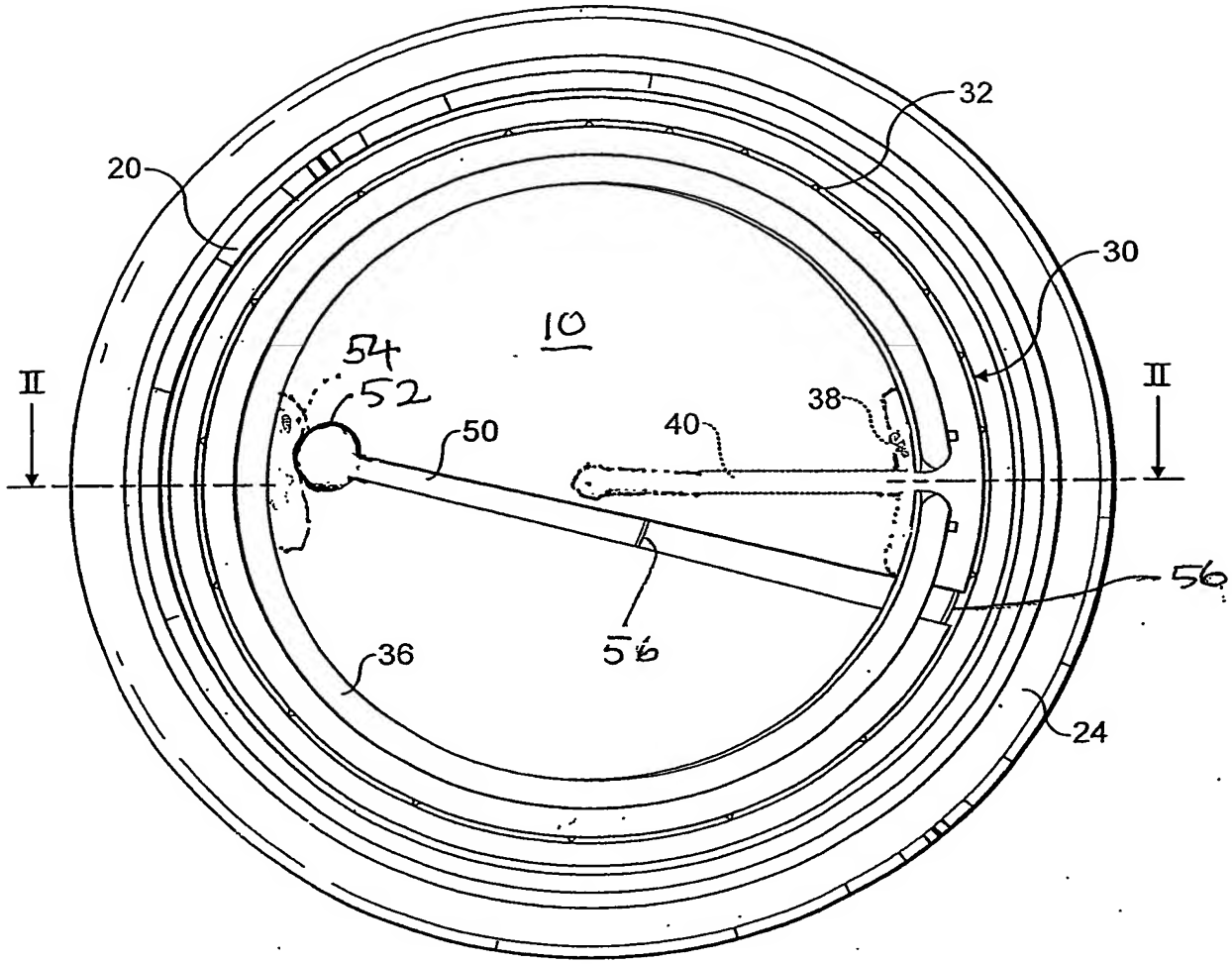
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FIG. 1

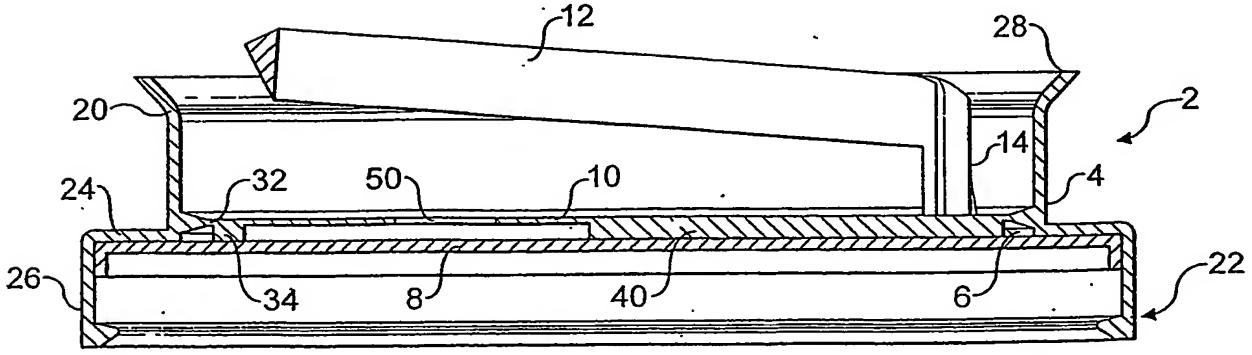
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FIG. 2

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